APPENDIX.

Additions and Corrections to Mr. VARLEY'S Paper on Iron and Steel, in Vol. XLVIII.

Page 261, omit the words between "I would," line 11, and "whole anchor," line 20, and insert the following:

And to effect this purpose, I would construct the anchors by combining or welding together, a number of plates whose outline should be brought correctly into the form of the intended anchor without flukes; and they should be made gradually thinner towards the ends of the bow and of the shank, so that when a proper number of these plates were put together, there should be a right quantity of metal in each part. The number of plates would depend on the thickness of the intended anchor, for they should each be of the best forging thickness. I would use new iron, and in reducing it to the malleable state, bring it into masses sufficiently large to form these plates. Each mass would require to be drawn out into three flat arms—one to form the shank, the other two the bow; and for the convenience of slinging I would work out at least two extra ears or arms, one at the peak, the other at the shank end: these arms of course to be cut off when they could be dispensed with.

When drawing out metal under the hammers, it requires beating on all sides to preserve its form and soundness: these anchor-like plates would be difficult to forge; but good workmen could overcome that difficulty. Probably the outside of the bow could be sufficiently hammered

whilst it lay flat; and for hammering the inside, the shank might be raised, and the bow slung against a mass that fitted its outside; and the shank could be turned about on the anvil. But constant care would be requisite to produce and preserve absolute soundness in the middle of the bow where the shank branches from it; and I would provide either a cast-iron recess, or build one up of sufficiently massy pieces of iron to receive these plates, with notches for the additional arms to project through; and in this recess the forging should be finished. The bottom of this recess should not be quite flat, but slightly concave, to make each plate rather thickest in the middle, in order that welding might first begin there, when these plates are ultimately to be so united; for, without this caution, it would be impossible to secure a sound union at the centre. In such a recess these plates could not extend laterally, but would all be brought to the same form, and might be re-heated and beat till they became quite sound and trust-worthy.

Thus formed, a sufficient number of these plates would make a good anchor, if only lashed or hooped together; and therefore, although I have provided for effecting the best central welding, there will not remain so much anxiety about obtaining it; because, as soon as the plates are united so as to hold together all round, there will rarely be any action on the anchor that will have any tendency to tear them asunder, yet I would not neglect obtaining the most complete union all through. Therefore I would first weld two of these plates together, then add a third, and then a fourth, and so on till I obtained the requisite thickness; and should do this in a recess capable of receiving the whole anchor. This might be the same recess in which the plates were separately hammered, with deeper sides built up, or a separate recess, as might suit

the conveniences of the establishment. This would produce square limbs; and when the welding was complete, I would chisel off the corners to avoid hammering them in, and only hammer them enough to smooth and finish them; for in the recess the mass may receive the most furious hammering that can be provided, and it may be continued for a long time, without having the power to strètch or damage the central portion; but whatever hammering is given to it out of the recess, tends to put the central parts in a state of tension whilst the outside is rather wedged together: this destroys that equal ease throughout which is so very essential in an anchor, where every part should contribute equally to bear the strain, for those parts that are left in a state of tension chiefly bear the pull, and must give way before the other parts can come to their full tension; indeed, it is probable that the strength of some parts is in constant exertion against that of the others, therefore such anchors are liable to break when falling on a hard bottom; for the weight of the whole, increased by its momentum, is exerted on one portion first, and when that has given way, the other portion remains alone to bear the shock: thus, with the weight of a large anchor there remains but the strength of a small one.

Page 263, line 27, insert the following as a note:—

By the favour of Mr. Cottam, Mr. Mason, and Mr. Brown, all members of the Society, who kindly offered me to witness experiments at their forges, it was shewn that square rods of the best iron, half an inch thick, would bear bending double and close whilst quite cold, without fracture, but beyond that thickness it tore open at the outside of the bend.

Page 268, line 5, after the word "flattened" insert "or rather wedge-shaped."

Page 269, after the word "longitudinally," line 18, insert, "and in the other it loses strength in the centre whilst it gains strength at the circumference."

Additions to Mr. C. VARLEY'S Paper on the Microscope in Vol. XLVIII.

P. 353, at bottom: It requires a considerable thickness of finely pulverised glass, or a large lump of dried carbonate of soda, to receive the bright focus of the lens; for though that may be small, the light will spread out in all directions, giving a very bland or soft and purely decomposed white light, much larger than is requisite for use. This, from the nature of its production, cannot be prevented; therefore, it is best to use a brilliant metal cup or a bright tin box, only a little larger and deeper than the requisite diameter; then nearly fill it, and slope the surface of the powdered glass towards the light by just shaking it to the off side; this will receive the light in the best manner; then that portion of light that would have spread out beyond the range of the usable diameter, will be reflected back upon the centre by the bright surface of the cup or box, and still farther increase the brightness of that central portion.

In the process for making small lenses, p. 376, I omitted to state, that for the very smallest lenses, such as the sixtieth and one hundredth, I have filled the metal cups with lead instead of hardened bees'-wax, because it stands better to the work and will polish well; but finding for large lenses it was liable to scratch, I changed it for clean shell-lac, which stands well for the very smallest lenses that can be worked, and does not scratch; for, although